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Surviving the Storm

A Guide to Hurricane Preparedness

FEMA Photo

Water from storm surge and heavy rains can inundate low lying areas.

Safer, Stronger, Smarter

Building to Survive the Storm

Before a hurricane hits, even before you build, you need to know the flood risks facing your residence. Forearmed, you can take steps to protect your home from excess damage.

Here are some of the risks in hurricane flooding. In coastal areas, high winds and waves can drive fast floodwaters ashore where they pick up debris. The storm surge can batter your house, knock it over or collapse it. Severe coastal flooding erodes soil under your home, weakening its foundation and encouraging collapse.

Inland, torrential rains can cause rivers and streams to rise and flood rapidly, posing the same threats to your home.

You Need to Know

Ask local emergency management and building officials about hurricane threats to your area. Also consult local floodplain administrators. State officials in the federal Coastal Zone Management Program can tell you about erosion rates and history where you live.

How to Protect Your Home

If your area is at high risk, consider relocating your home to a less flood-prone area. Or, consider elevating it on an open foundation of piles or columns, so floodwaters can pass underneath.

Buy flood insurance. Disaster assistance provides a helping hand toward recovery, but is not sufficient to fully replace your property. You want maximum resources to recover from flooding.

If You Are Building a Home

Contact local building officials, floodplain administrators and emergency management officials to learn about hurricane hazards. They can explain regulatory and permit requirements. Ask about state requirements, too.

Have work performed in compliance with a model state or national code. A qualified contractor, professional engineer or architect can assist you. Always obtain the proper building permits from your local building inspector or permitting authority.

Tropical Depressions Produce Deadly Storms

Hurricanes develop from tropical depressions (sustained winds up to 38 mph) to tropical storms (winds 39-73 mph) before becoming hurricanes (winds 74 mph or more).

The winds, a product of extremely low pressure zones powered by moisture from the sea and heat from condensation, spiral downward counter-clockwise. If the barometer drops below 1,000 millibars (29.53 inches), you should start monitoring weather broadcasts on the radio.

Usually the most dangerous part of a hurricane is the northeastern quadrant.

Wind gusts within a hurricane may exceed the sustained winds by as much as 50 percent. The time between the first rise in wind and a return to moderate levels is often 24 hours or more. But this varies greatly, depending on the size of the hurricane, its forward speed and its path. Rainfall also varies with these factors. As a hurricane passes through an area, 5 to 30 inches of rain may fall.

Keep in mind that a hurricane does not have to be a direct hit to cause great damage and that the course and intensity of a storm can change as it approaches your area.

Low pressure and strong winds around the hurricane's center raise the surface of the sea a foot or two higher than the surrounding water in a dome sometimes 50 miles across.

As the storm reaches shallow coastal waters, the dome becomes a surge that can rise 20 feet or more. The surge may smash onto land as a whole, producing massive destruction and flash flooding of coastal lowlands, or it may come ashore in a series of giant waves.

The highest storm surge is usually from near the eye of the hurricane in the quadrant where winds are blowing toward shore.

A storm surge can crush vessels and structures, erode miles of beach and undermine poorly anchored low-lying buildings.

FEMA Director James L. Witt

Each year, millions of Americans face the threat posed by hurricanes. Violent winds, destructive storm surge and torrential rains can cause devastation of property, personal injury and death.

We at FEMA, together with our partners in your state emergency management agency, stand committed to assist you in protecting your homes and loved ones from these dramatic reminders of nature's power.

Experience has shown us that lives can be saved and damage to property significantly reduced by consistently enforcing building codes, building safer, stronger buildings, and making the proper preparations when a storm is approaching.

Along with the many protective responsibilities that lie with government, there are individual responsibilities as well. Understanding and using the information contained in this publication will help you better prepare for this hurricane season. Working together we can prevent injuries and deaths associated with these powerful storms.

Protect Your Home From Hurricane Winds

Homes located in hurricane prone areas should be designed and constructed to withstand hurricane-force winds. High winds blow on the coast and inland, tearing off roofs, windows and doors. Heavy gusts can weaken or destroy your home's structural components.

See your local building officials, emergency management officials or floodplain administrator to learn how vulnerable your home is to hurricane winds.

Simple methods are available to protect your home from wind damage. For example, install hurricane straps and clips around your house to hold it together. Your roof should be rated for hurricane wind speeds in your community.

Put shutters on windows and glass doors to protect them from flying debris.

Consult a professional engineer or architect licensed in your state before taking these measures.

Hurricane Preparedness Tips

When a hurricane threatens your area, you must decide whether to evacuate or ride out the storm at home. Listen to the radio for weather advisories, and if authorities recommend evacuation for your area, leave promptly.

In general, plan to leave if you live on the coast or in a low-lying area not far inland, in a mobile home, or aboard a boat. You also should leave if you know your home is not structurally sound or if it is in an area that continually floods or is near a stream or gut likely to overflow in heavy rainfall.

If you need to seek emergency shelter, wait for notification from the American Red Cross officials of shelter locations.

Public shelters are set up as a temporary, emergency means of caring for people. A shelter's primary function is to provide a roof over your head. Food, blankets and amenities may not be available. Pets, weapons, alcoholic beverages and illegal drugs are not allowed in shelters. Smoking may be banned.

If you go to a shelter, travel light. Put everything into a portable disaster kit, including:

- Non-perishable food
- Drinking water (two to four quarts per person per day)
- Valuable papers such as your driver's license or other identification, bank books, insurance policies, property inventory and photographs
- Eating and cooking utensils, can and bottle openers
- Toiletries and sanitary supplies
- Medications, prescriptions, important medical information, eyeglasses, cleaning solution for contact lenses, hearing aid, and walking aids.
- Rope
- Portable radio with extra batteries
- Flashlight with extra batteries
- Blanket or sleeping bag for each person
- Small valuables such as photographs

Before you leave your home:

- Unplug all electrical appliances and machines and store them as high as possible.
- Turn off electricity at all breakers plus the main switch. Label breakers to identify what the lines carry.
- Store toxic materials as high as possible in the most protected area available.
- Agree with family members on a location to meet or a means of reaching one another with messages in the event you become separated.

Severity of Damage Linked to Wind Speed

The amount of damage you can expect from a hurricane is directly linked to the wind velocity of the storm. Winds in an intense storm may reach a sustained velocity of more than 150 mph with gusts up to 200 mph.

The National Hurricane Center uses the Saffir/Simpson scale that classifies storms into five categories. Here is a summary of possible damage to shorelines and vessels in each case.

CATEGORY 1

Winds 74-95 mph, storm surge four-to-five feet above normal. Flooded low-lying coastal roads, minor pier damage, some small craft in exposed anchorages torn from moorings.

CATEGORY 2

Winds 96-110 mph, storm surge six-to-eight feet. Coastal and low-lying roads leading inland flooded two to four hours before the hurricane eye passes over. Piers damaged, marinas flooded, small craft in unprotected anchorages torn from moorings.

CATEGORY 3

Winds 111-130 mph, storm surge nine-to-twelve feet. Smaller structures destroyed by coastal flooding; larger structures destroyed by battering waves and floating debris. Low-lying roads leading inland flooded three-to-five hours before the eye passes over.

CATEGORY 4

Winds 131-155 mph, storm surge 13-18 feet. Flooding of flat terrain up to 10 feet above sea level as far as six miles inland. Major flooding and wave battering damage to lower floors of structures near shore. Low-lying roads leading inland flooded three-to-five hours before the eye passes over. Major beach erosion.

CATEGORY 5

Winds above 155 mph, storm surge more than 18 feet. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore.

For Flood Insurance Information Call
1-800-427-4661

Plywood or shutters properly installed over windows and glass doors provides the best protection from high winds and flying debris.

Know Your Weather Terminology

ADVISORY. Hurricane and storm information disseminated to the public every six hours.

INTERMEDIATE ADVISORY. Information update every two-to-three hours, or as necessary.

SPECIAL ADVISORY. Information disseminated with any significant change in storm-related weather conditions or warnings.

GALE WARNING. An advisory of 39-54 mph sustained winds and strong wave action.

STORM WARNING. An advisory that sustained winds of 55-73 mph are expected.

HURRICANE WATCH. An indication that a hurricane may threaten a specific area but is not imminent.

HURRICANE WARNING. An advisory that a hurricane is expected to strike the specified area within 24 hours or less, with sustained winds of 74 mph or higher and dangerously high water and waves.

TROPICAL DISTURBANCE. A moving area of thunderstorms in the tropics.

TROPICAL WAVE. A westward-moving, low-pressure trough in the deep easterly current that tends to organize low-level circulation and sometimes travels thousands of miles with little change in shape, producing showers and thunderstorms along its path.

TROPICAL DEPRESSION. An area of low pressure, rotary circulation of clouds and winds up to 38 mph.

TROPICAL STORM. Counter-clockwise circulation of clouds and winds of 39-73 mph. At this stage the storm is assigned a name.

HURRICANE. A tropical storm with winds of 74 mph or more.

HURRICANE CENTER or EYE. The relatively calm area near the center of the storm which can last from several minutes to more than an hour.

CAUTION!

When venturing out after a storm stay away from downed power lines as they present a danger of electrical shock or electricution.

Hurricane Preparations: Know Wh

A Hurricane Warning Means Get Ready

A **hurricane warning** is issued for an area when a hurricane is expected to strike within 24 hours. If you know your home is structurally sound and not likely to flood and you decide to ride the hurricane out, there are many simple but important precautions to take before the storm strikes. For your own well-being and that of others:

Listen to the radio for advisories and emergency information from local officials and the National Weather Service.

Limit telephone calls to short, essential messages.

If you are elderly or disabled, consider asking a friend to stay with you.

If you have room, consider giving refuge to neighbors, relatives, or elderly or disabled persons who live in a flood-prone area.

If a doctor has advised that any ill or disabled persons in your home stay elsewhere, move them early.

If you don't have a vehicle, arrange ahead of time for transportation in case evacuation becomes necessary.

When you complete your precautions, offer to assist neighbors, particularly families with very young, elderly or disabled persons.

Surviving the Storm is published by the Federal Emergency Management Agency, and your state emergency management agency. Comments and inquiries about *Surviving the Storm* may be directed to 1-800-525-0321.

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As the Hurricane Approaches

OUTSIDE

Disconnect and take down any TV antenna or small satellite dish.

Remove or roll up and lash canvas awnings. Close and secure shutters. If you don't have shutters, board windows and sliding-glass doors. Cover screens in plastic trash bags and make sure they are securely in place.

Secure outdoor items that might blow away or be torn loose and hurled through the air by the wind.

Move carts and trailers from under trees and turn them over or remove the wheels.

Cut down dead tree limbs and remove them, along with limbs on the ground near your home. Pick any fruit on your trees.

Drain swimming pools about halfway. Disconnect the power and add extra chlorine to the water. If the filter pump is exposed, wrap it with a waterproof covering and tie it in place.

Fill buckets with sand and take them inside for use if fire breaks out.

Park vehicles in a garage or away from trees, utility poles and guts. Set emergency brakes.

INSIDE

Make sure door and window locks hold securely. Wedge sliding glass doors with braces or broom handles to prevent their being lifted off the tracks or ripped loose by wind or vibrations. Have towels ready in case rain seeps in.

Move furniture away from exposed doors and windows.

Draw drapes and close blinds.

Wrap glass objects, artwork, photographs, fragile items of sentimental value, tools, electronic equipment and small appliances and store them in a protected area. Do the same with jewelry, titles, deeds, insurance papers, licenses, stocks and bonds and inventory lists after placing them in waterproof containers.

Sterilize the bathtub, washing machine and other containers with bleach and let them dry. Line the tub with plastic to prevent drain leakage and fill it and the other containers with water for drinking, cooking, washing and bathing. (Note: Boil this water before drinking it.)

As hurricane winds strengthen, disconnect power at the master switch. If power is still on, don't touch electrical equipment in a wet location unless you are standing on a piece of dry wood and wearing rubber footwear and gloves.

During the Hurricane

Remain indoors. Wind, downed live power lines and falling or flying trees and debris all pose serious danger.

Stay on the side of the house opposite the direction the wind is coming from. As the wind shifts, move to a room on the opposite side. If you have a room within a room, such as a bathroom, stay there during the height of the hurricane. Keep away from windows and glass doors.

Don't go out during the calm as the eye of the hurricane passes overhead. The wind may cease for several minutes or for an hour or more, and the sky may clear, but this is only the mid-point of the hurricane. The lull will end suddenly as the wind strikes from the opposite direction, rising rapidly to hurricane force, often stronger than before.

If the roof blows off or the house shows signs of collapsing, take cover in a room within a room such as a bathroom or under a stairway, strong table or door frame.

Make the effort to remain calm and encourage your family members, especially children, to stay calm. Stay inside until you are absolutely sure it's safe to go out again.

hat to do Before the Storm Strikes

FEMA Photo by Andrea Booher

Hurricane winds were strong enough to uproot this tree and send it crashing onto this couple's car.

In case of a Hurricane Watch

A hurricane watch is issued when a hurricane may threaten an area but is not imminent. At this point, you should immediately begin to gather the survival supplies and materials that you will need in the event that a hurricane reaches your area.

Some examples:

Materials to protect glass windows and doors (shutters, plywood, masking tape) and the tools to install and apply them.

Several days' supply of canned food and beverages and non-perishable foods that don't need refrigeration or cooking. Buy food and beverages in containers and packages that will allow for immediate consumption with no leftovers.

An adequate supply of needed prescription drugs, other medications and basic first aid supplies.

Filled fuel tanks and safe battery water levels on your vehicles.

A good supply of clean clothing and linens.

A transistor radio and flashlights that work, along with fresh batteries to last several days.

In addition, you should:

Be sure all doors are watertight.

Use bleach to clean the bathtub, washing machine and containers with covers to store water for drinking, cooking and washing for severa`l days. For drinking, you will need containers with covers to hold two quarts of water per person per day. (If you rely on commercially bottled water for drinking, be sure to have several days' supply on hand.)

Know how to use any fuel-operated lanterns you have safely, and have several days' supply of fuel.

Be sure your fire extinguishers are fully charged.

Know where your main turn-off switches are for electricity, water and gas.

If there are ill or disabled persons in your home, ask a doctor on where they should stay in the event a hurricane approaches your area. If relocation will be necessary, have plans in place.

Make arrangements ahead of time if you want to board pets at a veterinary facility.

Animals Need Help, Too

Here are ways to protect your pets and livestock as a hurricane approaches:

Put identification tags on the animals.

If you plan to remain at home, bring pets inside with you. Have newspapers on hand for sanitary purposes.

Shelt birds and chickens. Put larger livestock on the loose in an open field with plenty of food and water.

As a rule, public shelters will not take pets.

If you are not going to stay in your home during the hurricane and can't take your pets with you, arrange to leave your pets with your veterinarian or friends, or leave them loose inside your home with dry food and plenty of water. Remove the toilet tank lid, raise the seat and brace the bathroom door open so they can drink.

Do not leave pets outside or tied on leashes.

Hurricane First Aid Kit

Hydrogen peroxide or Betadine solution
Rubbing alcohol
12 gauze bandages (4" x 4")
1 roll 1/2" adhesive tape
1 roll 2" gauze bandage
Antibiotic cream
Box of adhesive bandage strips
Aspirin or acetaminophen
Petroleum jelly
Eye drops
Clean fabric for sling
Baking soda or Epsom salts
Milk of magnesia
Cotton swabs

FEMA Photo

Torrential rains associated with hurricanes and tropical storms can cause flooding hundreds of miles inland.

Flood Insurance:

The Best Protection Money Can Buy

Most homeowners' policies do not cover flood damage. Fortunately, however, federally backed flood insurance protection is available through the National Flood Insurance Program (NFIP).

NFIP coverage is available from any property and casualty insurance agent or broker. Homeowners can get up to $250,000 in coverage; businesses, up to $500,000.

Flood insurance is available for virtually any building that is walled, roofed and principally above ground, along with building contents. Separate policies are needed for each structure.

Building owners can insure both structure and contents; renters and condominium owners, only the contents of their units. Condo associations should insure such commonly owned areas as walls, roofs, floors and stairways.

Mobile homes can be insured if they are on a permanent foundation and anchored to resist flotation, collapse or lateral movement.

NFIP rates are set by the federal government. A 30-day waiting period applies from the date of application until coverage becomes effective with payment of the premium.

If property is located in a Special Flood Hazard Area on the Flood Insurance Rate Map, flood insurance must be purchased to be eligible for any federal or federally related financial construction or acquisition assistance.

Those who live in Special Flood Hazard Areas and receive federal disaster loans or grants are required to purchase and maintain flood insurance. Otherwise, many forms of disaster assistance may be denied in future floods.

Since 1969, the NFIP has paid over $6.9 billion in claims to policyholders. Currently, the NFIP protects more than three million policyholders with more than $330 billion in coverage. All NFIP claims and operating expenses are paid by policy premiums. No federal tax dollars are used for this purpose.

For more information about flood insurance call toll free 1-800-427-4661.

Emergency Planning Could Save Your Business

If a hurricane is threatening the area where your business is located, take the following steps:

Photograph your business establishment, inside and out, from all angles, to help substantiate any insurance claims later.

Assemble papers such as insurance policies, checkbooks and financial records, and pack them in waterproof containers.

Arrange to pay your employees, preferably in cash, as it may be some time before banking institutions reopen after a hurricane.

Clear out areas with extensive glass frontage, as much as possible. If you have shutters, use them. Otherwise, board up windows and glass doors.

Remove outdoor hanging signs.

Bring inside or secure any objects that might become airborne and cause damage in strong winds.

Secure and tape showcases, turning the glass side toward an inside wall where possible.

Store as much merchandise as high off the floor as possible, especially goods that could be in short supply after a storm.

Move merchandise that cannot be stored away from windows and glass skylights, and cover it with tarpaulins or heavy plastic.

Secure generators, along with the fuel needed for its operation.

Secure all goods in warehouses above the water level, and place sandbags in spaces where water could enter. Remove lower drawers from file cabinets, put them in plastic trash bags and store them on top of the cabinets.

Turn off gas, water heaters, stoves, pilot lights and other burners.

A Boater's Guide to Hurricane Readiness

Planning, preparation and timely action are the keys to saving lives, preventing injury and reducing property damage to pleasure boats and live-aboard vessels in a hurricane.

Each boat owner needs a plan specific to the vessel, for where it is normally kept and for where it might be moved for protection.

PRIOR TO HURRICANE SEASON

See that your vessel is in sound condition. Check out the hull, deck hardware, rigging, ground tackle, machinery and electronics; be sure batteries are charged, bilge pumps are operable and all equipment is secured. Absentee owners should arrange for a haulout or supervised inspection.

Inspect primary cleats, chocks, winches, bitts and bollards. Be sure they have substantial backplates and adequate-size stainless steel bolts.

Acquire any needed *emergency gear* such as extra mooring lines, screw anchors, fenders, fender boards, chafing gear and anchors.

Identify hurricane holes and safe harbors in the area, assemble emergency equipment and supplies, come up with a *refuge plan* — and then *practice* it to see how much time and work are involved and what aspects need to be revised.

Make sure your *insurance coverage* is current; read the policy thoroughly for information relative to the coverage, exclusions and your responsibilities as the vessel owner.

Assemble your insurance policies, boat registration, a recent photograph of the vessel, gear inventory, marina or storage lease agreement and important telephone numbers — the local harbormaster, Coast Guard, National Weather Service, insurance agent — and put them in a secure place off the boat.

Know your responsibilities and liabilities as well as those of the marina or storage facility, if you keep your boat tied up or in storage.

Inventory items to be removed from the boat and items to leave aboard; keep copies on board and ashore. Mark valuable items for identification.

WHEN A HURRICANE WATCH IS ISSUED

Monitor marine radio weather reports continuously.

Identify the safest reachable haven and move your boat there at least 48 hours before a hurricane is expected to strike your area.

Have written copies of your *hurricane plan* aboard and with associates on shore; be sure family members and crew read and understand it.

See that fuel tanks are full, fuel filters are clean, batteries are charged, bilges are clean, cockpit drains are clear, firefighting equipment works and livesaving equipment is in good condition and readily accessible.

Make anchoring or mooring provisions. Check the condition of existing mooring hardware and lines.

Ensure watertightness above and below the waterline by sealing hatches, windows and doors with duct tape if necessary, shutting seacocks and capping off or plugging unvalved through-hull fittings.

Remove all equipment on deck that you can, including roller furling sails. Lash down everything you cannot move, such as tillers, wheels and booms.

Double all lines. The second set of lines should be a size larger than the regular ones. Rig crossing spring lines fore and aft. At a marina with strong pilings, attach lines high on them to allow for surge and install preventers so they cannot slip off the top. To prevent chafing, use double neoprene hose, or wrap lines at rough points with tape, rags or other protective material. Put out fenders and fender boards to guard against rubbing against pilings, pier and other vessels. If possible, occupy two slips, rather than one. Recheck the attachment of primary cleats, winches and chocks.

See that your *batteries are fully charged* to operate automatic bilge pumps for the duration of the storm. Consider backup batteries. Disconnect all devices that use electricity except bilge pumps.

WHEN A HURRICANE WARNING IS ISSUED

Monitor marine radio reports continuously.

Prepare to have all aboard leave the vessel. Boat owners unwilling to do this must weigh the desire to stay aboard carefully. **Of eight confirmed deaths in Hurricane Marilyn, at least seven, were individuals who remained aboard boats.**

AFTER THE HURRICANE

Check the condition and security of the vessel as soon as it is safe to do so.

If it has been damaged, take immediate action to save the vessel and/or equipment and prevent further loss or damage — this is a requirement of all marine insurance. Notify your insurance agent as soon as you can.

Pickle the engine immediately and purge the boat of marine life and saltwater.

Report any theft or vandalism loss or damage to law-enforcement authorities promptly; obtain a copy of the incident report or at least its number.

If salvage removal of the vessel is necessary and you must make arrangements yourself, read the salvage contract, and find out where your vessel is being taken and if security is to be provided.

Take Special Precautions With Mobile Homes

Mobile homes are particularly vulnerable to hurricane-force winds. Do what you can to secure your home, and then take refuge with friends or relatives or at a public shelter. But before you leave, be sure to take the following suggested precautions:

- Wrap breakables, pack them in boxes and put the boxes on the floor.
- Remove and tape mirrors. Place lamps and mirrors in the bathtub or shower wrapped in blankets.
- Tape X's on the inside of windows.
- Disconnect electricity, sewer and water lines. Shut off propane tanks. Leave the tanks outside and anchor them securely.
- Store awnings, cabanas, folding furniture, trash cans and other such outdoor objects.
- Use over-the-top and frame ties to anchor the mobile home.

FEMA Photo

Hurricane force winds can cause serious roof and structural damage. Proper use of hurricane connectors reduces the possibility of structural failure.

Roofs Most Prone to Wind Damage

Roofs are the portion of the house most prone to hurricane damage. Proper roof construction is essential. All lumber used in roof construction should be structural grade material.

The roof framing members should be properly tied with hurricane connections to the exterior walls and in some cases to the interior walls of the house.

The roof should have adequate ventilation to remove humidity and to help equalize the interior and exterior pressures. These vents should be properly sized and strategically located.

All construction must comply with your local building code and you should obtain all required permits from your local building department.

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